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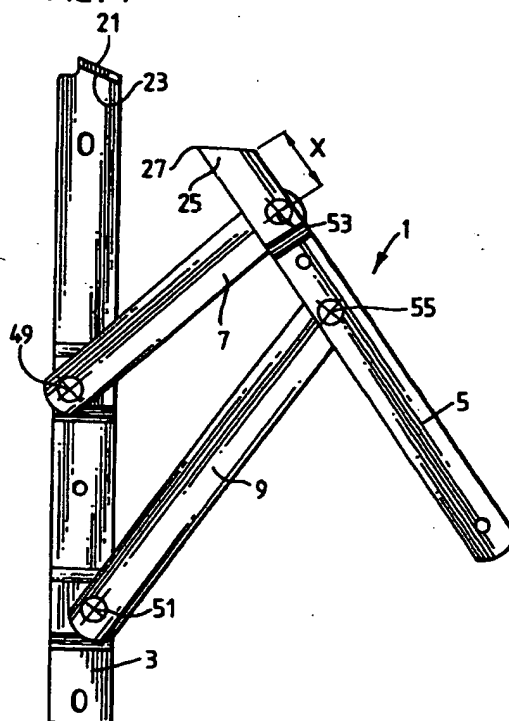
INT CL<sup>6</sup> E05C 17/00, E05D 15/28 15/30 15/32 15/40  
15/44 15/46

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(54) A stay for a vent

(57) A stay-hinge for a vent comprises mounting means (3) for attachment to a fixed frame, a vent arm (5) for attachment to a vent such as a window and first and second links (7,9) pivotally connecting the mounting means and vent arm, the line through the pivots (53,55) connecting the links and the vent arm being inclined to the axis of the arm and vent to ensure alignment of the vent arm and mounting means when the vent is closed. The line through the pivots (49,51) on the mounting means may be similarly inclined to the axis of the latter. End cap constructions (21,33,39) and cooperating stop means on the link (70) and vent arm which limit opening of the vent are also disclosed.

FIG. 1



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1995

FIG. 1

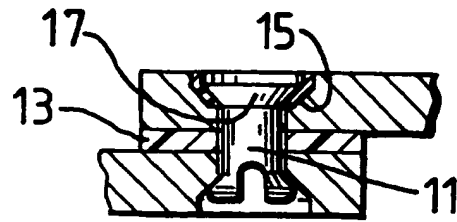
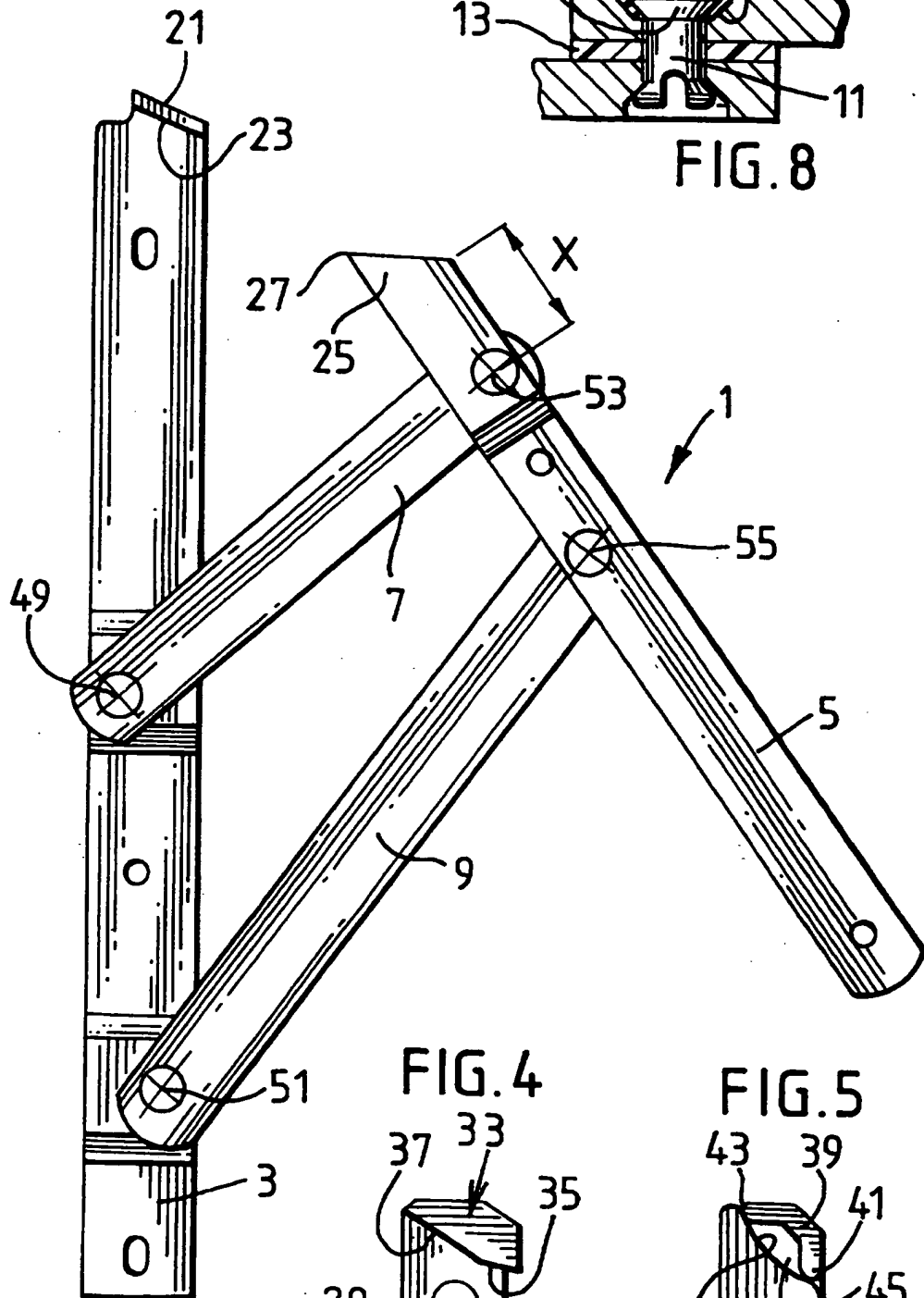


FIG. 8

FIG. 4

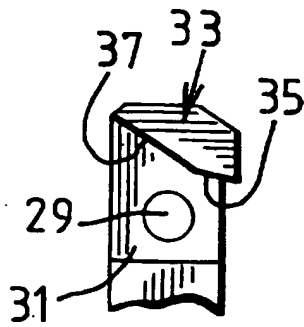


FIG. 5

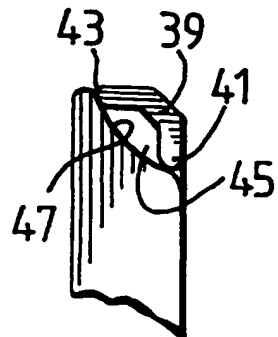


FIG. 2

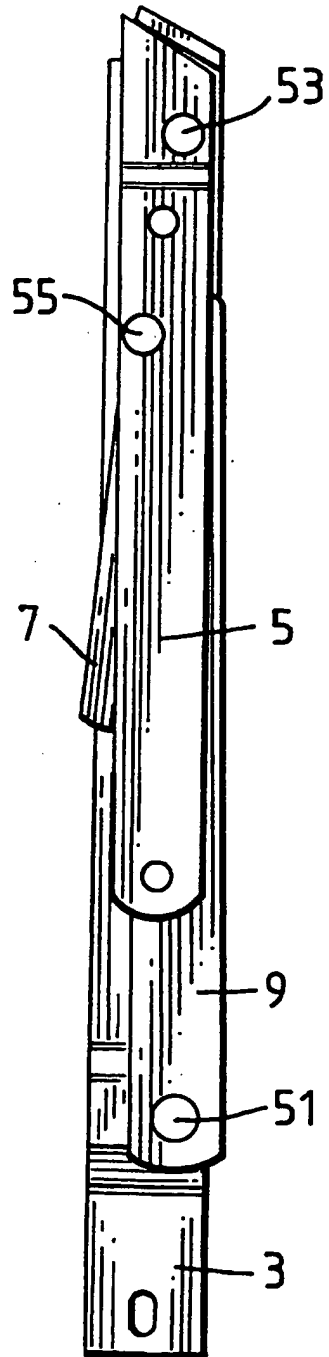
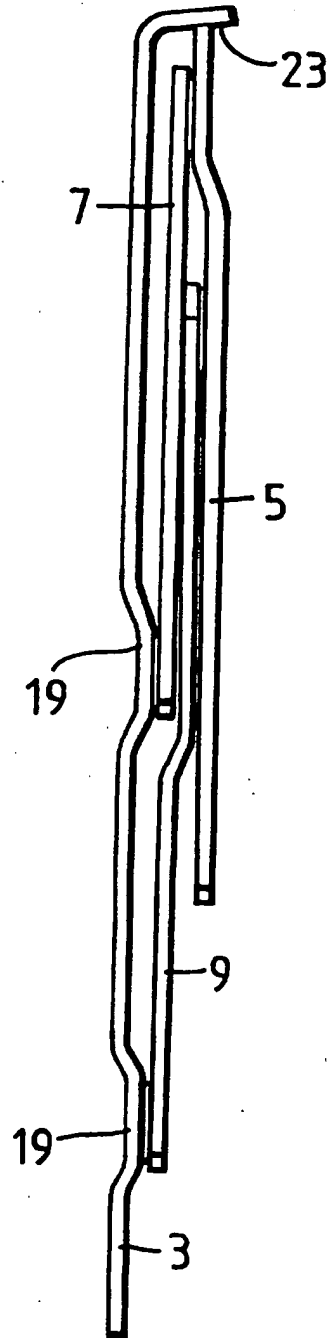


FIG. 3



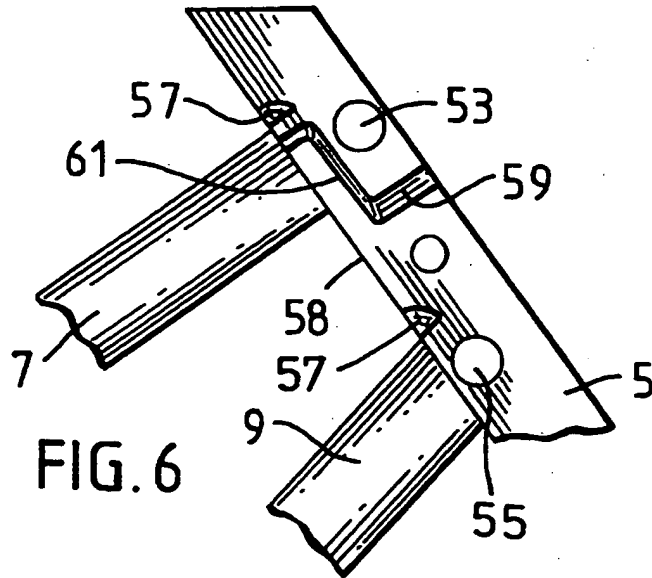


FIG. 6

FIG. 6A



FIG. 6B

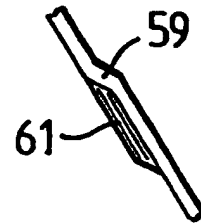


FIG. 7

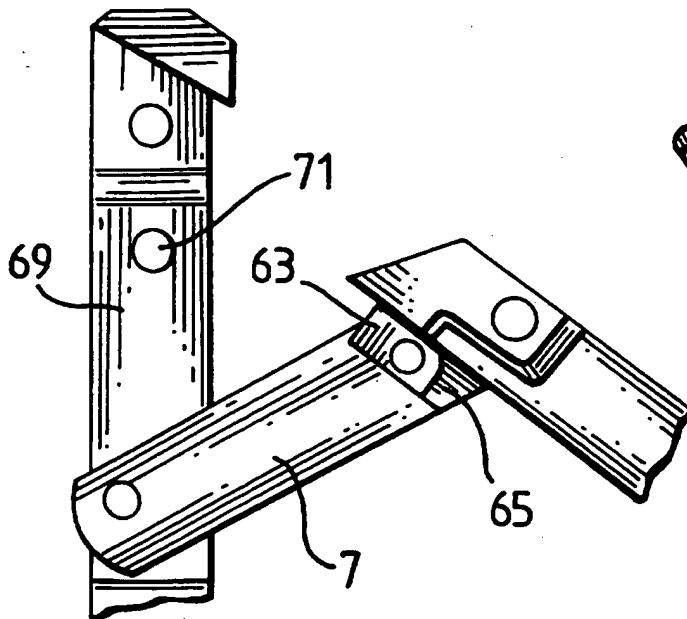
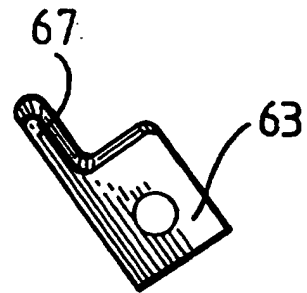


FIG. 7A



A STAY

This invention relates to stays, and in particular to a novel and inventive form of four bar stay for vents, such as windows.

Known four bar stays have, in general, tended to occupy the cheaper end of the market and, as a result, have tended to be very basic in design. Indeed, a typical four bar stay for a window simply comprises two elongate brackets attached to each other by means of two links or struts which are pivoted at each end. One of the brackets is for attachment to a fixed frame of a vent and the other of the brackets is for attachment to a sash of the vent. In use, the sash can be moved from a position closing the opening of the vent to a position in which the vent is open.

In the light of the foregoing, the present applicant has developed a new range of four bar stays or hinges which are a marked improvement over the prior art four bar stays, and yet are still relatively cheap and easy to manufacture.

With the foregoing in mind, the present invention provides a new and inventive four bar hinge which is a distinct improvement over known four bar hinges.

The proposed four bar stays have a number of novel features, as discussed below. Where applicable these novel features may also be incorporated into other forms of stay, such as six bar stays or friction stays.

In each four bar stay according to the present invention there is provided a frame bracket (or support track) for attachment to a fixed frame of a vent, a vent arm for attachment to a sash or window of the vent, a first link pivotally attached to the frame bracket and to the vent arm and a third link pivotally attached to the frame bracket and to the vent arm at points spaced from the pivot points of the first link.

Although the frame bracket may be a C-section support track of known shape, it may alternatively be formed from a simple flat strip of metal. Further, it may be preferable that the frame bracket includes a raised portion, possibly

formed by means of kinks in the flat strip, for each pivot point on the frame bracket. As a result, the stay may be fitted into the grooves of many different vent frame profiles.

5 In the prior art, it is usually the case that a vent arm of a four bar stay does not become aligned over the frame bracket when the stay is in its closed position. However, the present applicant has overcome this problem, while still allowing the vent arm to open in a satisfactory fashion, by  
10 off-setting the two pivot points of the frame bracket and/or off-setting the two pivot points on the vent arm. As a result, when the stay is closed, the vent arm is positioned over and aligned with the frame bracket of the stay. This is a marked improvement over known four bar stays.

15 Further, the idea of offsetting pivot points of links on a support track and/or a vent arm may be useful in many different types of stay, other than four bar stays.

In a preferred embodiment, the pivot points of the first link are positioned towards the edges of the vent arm and  
20 frame bracket respectively which are furthest from each other, whereas the pivot points of the third link are preferably positioned towards the edges of the vent arm and frame bracket respectively which are closest to each other.

Further, the pivot points of the first and/or third  
25 links may be offset from the longitudinal axis of the respective link to ensure that the link completely overlays the frame bracket when the four bar stay is closed. In this way, the links will not protrude outside the edges of the frame bracket, thereby avoiding any chance of clashing with  
30 adjacent parts of the vent.

As will be appreciated, the frame bracket and the vent arm each include holes or apertures through which fastening devices, such as screws, may be applied to secure the frame bracket and the vent arm to the fixed frame and the sash  
35 respectively of the vent, in use.

The vent arm may include an end point which is asymmetric. In one embodiment, the end point is produced by simply chopping off a corner from the end of the vent arm

such that an inclined edge is produced defining an apex adjacent the edge of the vent arm nearest the frame bracket. This apex may engage an end cap on the frame bracket to assist in aligning the vent arm over the frame bracket when  
5 the stay is closed. With this in mind, the distance from the apex to the pivot point of the first link on the vent arm is preferably longer than is normally the case in four bar stays, thereby enabling better engagement between the end point and the end cap to be achieved during closing of  
10 the stay.

In one embodiment, the end cap is simply formed by deforming the end of the frame bracket. Such an end cap is very cheap to manufacture, since no additional component is required.

15 Preferably the end cap defines a surface inclined to the axis of the frame bracket. Further, it may be preferable for the angle of inclination of the end cap surface to be slightly different to that of the complementary surface on the end point of the vent arm. As a result, better pull-in  
20 of the end point of the vent arm by the end cap during closing of the stay can be achieved.

Preferably a portion of the frame bracket, which is deformed to define the end cap, is removed to accommodate the apex of the vent arm end point when the stay is fully  
25 closed.

Alternative forms of end cap and/or end point, which may be applicable to other types of stay, may be used, as appropriate. For example, a separately formed end cap may be attached to the frame bracket during manufacture or  
30 during installation of the stay. If the end cap is attached to the frame bracket during manufacture, a rivet may be applied through both the frame bracket and a tongue of the end cap.

If a separately formed end cap is used, it may include  
35 two bearing surfaces inclined at different angles to the axis of the frame bracket. If this is the case, the inclined surface first engaged by the end point of the vent arm during closing of the stay may be at a relatively

shallow angle, whereas the second inclined surface of the end cap may conform to the inclined edge of the end point of the vent arm.

In another form of end cap, the cap may include a recess  
5 into which the end point of the vent arm may fall during closing of the stay after having passed an initial abutment of the end cap. A subsequent abutment of the end cap will preferably force the end point of the vent arm into its final desired closed position as the vent arm reaches its  
10 closed position over the frame bracket. By providing the recess in the end cap, more efficient closing of the stay can be achieved with a reduction in the friction between the end point and the end cap.

Additionally, the inclined edge of the end point may be  
15 curved, preferably in a concave fashion, to improve the engagement of the end point with the end cap during closing the stay.

Another improved feature provided by a stay according to the present invention is the inclusion of a stop or stops  
20 to define the maximum opening of the stay. In one embodiment, a stop acts between the vent arm and the first link to define the maximum opening of the stay. If necessary, or if simply preferable, a second stop may act between the vent arm and the third link of the stay. In  
25 either event, the stop may be formed by means of a crack formed in an edge of the vent arm with the portion of the vent arm defined by the crack being bent out of the plane of the vent arm to act as the stop. Other forms of stop may, of course, alternatively be used as appropriate.

30 By including one or more stops to define the maximum opening of the stay, additional strength is given to the stay.

The stay may be further strengthened by including a novel shape of shoulder around the pivot point of the first  
35 link to the vent arm. More particularly, the vent arm may include an S or Z shaped shoulder adjacent to the pivot point. With this in mind, it is known to have a straight shoulder running across the width of the vent arm to enable



the end point of the vent arm to be offset from the plane of the remainder of the vent arm, but a non-straight shoulder is a feature of the present invention which is not known in the prior art. More particularly, the shoulder may include  
5 two portions extending from opposite edges of the vent arm with a central portion or rib which runs substantially parallel to the longitudinal axis of the vent arm and joins the two other shoulder portions. This central shoulder or rib preferably runs along the vent arm from one side of the  
10 pivot point between the first link and the vent arm to the other side of the pivot point.

A support or guide block may be included on the first link and/or on the third link to assist the motion of the vent arm over the first link and/or the third link during  
15 closing of the stay. Such a guide or support block may be attached to the first link or the third link by means of a rivet or simply a push fit connection. Any other means for connecting the block to the link may, of course, alternatively be used.

20 Although the guide block may only come into play when the stay is partly closed, in another embodiment a portion of the guide block may act as a washer or lubricating surface between the vent arm and the link. If this is the case, the block will preferably have a shape which conforms  
25 substantially to the shoulder of the vent arm adjacent the pivot between the vent arm and the first link.

If preferable, a support block may also be mounted on the frame bracket to assist the vent arm as it closes over the frame bracket. Such a support block may be held in  
30 position by means of the pivot between the frame bracket and the first link, for example, an additional rivet may also be used, if necessary.

As will be appreciated, a stay according to the present invention includes four pivot points. Each of these pivot  
35 points includes a pivot, such as a rivet, for joining two components together. To assist in smooth movement between the two components as the stay is opened or closed, at least one washer is preferably included about the pivot between

the components. This washer may include an integral spigot on one or both sides of the washer which can carry the components. Alternatively, a second simple washer may be included under the head of the rivet between the rivet head  
 5 and the adjacent component. As a result, smoother opening and closing of the stay can be effected.

Additionally, by including one or more washers, a degree of controlled friction can be introduced in the stay to enable the stay to be held in a particular position  
 10 intermediate the fully open and the fully closed positions of the stay. Such a stay equates to the known friction stays, wherein a slider is included in a support track of the stay for defining the position of the stay.

In a preferred embodiment, a pivot of a four bar stay  
 15 according to the present invention includes two washers which are essentially identical. One of the washers is, however, deformed by means of the head of the rivet defining the pivot.

Specific embodiments of the present invention are now  
 20 described, by way of example only, with reference to the accompany drawings, in which:

Figure 1 is a plan view of a stay according to the present invention in an open position;

Figure 2 is a plan of the stay of Figure 1 in a fully  
 25 closed position;

Figure 3 is a side view of the stay shown in Figure 2;

Figure 4 is a plan view of a second type of end cap for a stay according to the present invention;

Figure 5 is a plan view of a third embodiment of end cap  
 30 for a stay according to the present invention;

Figure 6 is a partial view of a second embodiment of stay according to the present invention showing the vent arm, first link and third link only;

Figure 6A is a side view of the stops shown in Figure  
 35 6;

Figure 6B is a side view of the shoulder of the vent arm shown in Figure 6;

Figure 7 is a partial plan view of another embodiment

of stay according to the present invention showing only the vent arm, first link and frame bracket;

Figure 7A is a plan view of an alternative guide block of the type shown in Figure 7; and

5      Figure 8 is a sectional side view of a pivot included in a stay according to the present invention.

With reference to Figures 1-3 of the accompanying drawings, a four bar stay 1 according to the present  
10      invention comprises a frame bracket 3 for attachment to a fixed frame (not shown), a vent arm 5 for attachment to a sash (not shown), a first link 7 pivotally attached to both the frame bracket 3 and the vent arm 5 and a third link 9 similarly pivotally attached to both the frame bracket 3 and  
15      the vent arm 5. The pivot axes are defined by rivets 11 of the type shown in Figure 8. In each case, a first annular plastics washer 13 separates the two components held together by the rivet 11 and a second plastics washer 15 is deformed by the head 17 of the rivet 11 during assembly of  
20      the stay 1. The washers could be identical before assembly, both being made of acetyl resin or any other appropriate material. As shown in Figure 8, however, the washer between the components of the stay 1 has a larger diameter and a greater thickness than the washer 15 under the head 17 of  
25      the rivet 11.

By including the two washers 13,15 about each rivet 11, a smoother action is provided for the stay 1 during opening and closing the stay 1. Furthermore, a degree of controlled friction is provided to the stay 1, which can be used to  
30      control the position of the vent arm 5 relative to the frame bracket 3 in an open position of the stay 1.

As seen in Figures 1 and 3 of the drawings, each pivot on the frame bracket 3 is formed at a portion 19 of the frame bracket 3 which is raised relative to the main plane  
35      of the frame bracket 3. This helps to avoid clashing of the links 7,9 with the frame bracket 3 during closing of the stay 1. Such raised portions 19 are readily formed in the frame bracket 3 because the frame bracket 3 is simply a

strip of metal that can be readily deformed into the desired shape. Furthermore, an end cap 21 can be formed at the end of the frame bracket 3 simply by bending the tip of the frame bracket 3 through 90°. The resulting surface 23 of the end cap 21 is inclined to the longitudinal axis of the frame bracket 3 to assist in pulling in the vent arm 5 during closing of the stay 1.

The vent arm 5 includes an end point 25 which is simply formed by cutting off a corner of the end of the vent arm 5 to define an apex 27. It is this apex 27 which engages the inclined surface 23 of the end cap 21 and is guided into the fully closed position of the stay 1 as shown in Figure 2 of the drawings. To accommodate the apex 27 of the end point 25 of the vent arm 5, a corner of the frame bracket 3, including a portion of the end cap 21, is removed, as clearly seen in Figure 1 of the drawings.

If a plastics end cap is required for the frame bracket 3, an end cap such as shown in Figure 4 or Figure 5 could be used. In either event, it will be necessary to attach the end cap to the frame bracket 3, possibly by means of a rivet 29 engaging through a tongue 31 of the end cap 33 and the frame bracket 3, as shown in Figure 4 of the drawings. Alternatively, the end cap could simply be fixed to the frame bracket 3 with a snap-on fit, by means of a detent (or stake) formed in the frame bracket engaging the tongue or by means of a screw applied through both the tongue 31 of the end cap 33 and the frame bracket 3 during installation of the stay 1.

As can be seen in Figure 4 of the drawings, the end cap 33 includes two bearing surfaces 35,37 instead of the one surface 23 as in the end cap 21 shown in Figure 1 of the drawings. Although the first bearing surface 35 is at a similar angle (to the longitudinal axis of the frame bracket 3) as in the first embodiment, the second bearing surface 37 is at an angle which corresponds to the angle defined by the end point 25 of the vent arm 5 when the stay 1 is in its closed position. By including the bearing surfaces 35,37, more efficient pull-in of the vent arm is achieved during

closing of the stay 1.

With regard to the third embodiment of end cap 39 as shown in Figure 5 of the drawings, this includes a first abutment 41, a second abutment 43 and a recess 45 therebetween. During closing of the stay 1, the apex 27 of the end point 25 of the vent arm 5 is initially guided by the first abutment 41 prior to the apex 27 being free to enter the recess 45. Subsequently, the apex 27 is guided by the second abutment 43 into its final position as shown in Figure 5 with the vent arm 5 overlaying the frame bracket 3. By allowing the apex 27 to enter the recess 45, a smoother closing action of the stay 1 is achieved. This closing action may be further improved by forming the end point 25 of the vent arm 5 with a concave surface 47, as shown in Figure 5 in the drawings.

In many prior art four bar stays, the length of the part of the vent arm 5 between the rivet 11 joining the first link 7 to the vent arm 5 and the end point 25 of the vent arm 5 is very short. This distance is shown in Figure 1 as X. In a stay 1 according to the present invention, distance X is significantly longer than in the prior art stays, and this has the effect of enabling a smooth entry of the end point 25 into the end cap 21 to occur during closing of the stay 1.

As can be seen clearly in Figures 1 and 2 of the drawings, the two pivot axes 49,51 on the frame bracket 3 are offset to opposition sides from the longitudinal axis of the frame bracket 3. In particular, the pivot axis 49 of the first link 7 is offset in a direction away from the vent arm 5, whereas the pivot axis 51 is offset from the longitudinal axis of the frame bracket 3 towards the vent arm 5. Similarly, the pivot axes 53,55 of the vent arm 5 are offset from the longitudinal axis of vent arm 5, with the pivot axis 53 of the first link being offset away from the frame bracket 3 and the pivot axis 55 of the third link being offset towards the frame bracket 3. As a result, closing of the stay 1 occurs in a smooth fashion and results in the longitudinal axis of the vent arm 5 being parallel to

and aligned with the longitudinal axis of the frame bracket 3. This is shown in Figure 2 of the drawings. As mentioned above, this is a marked improvement over the known prior art four bar stays, wherein the vent arm 5 is often inclined to the axis of the frame bracket 3 when in its closed position. Such misalignment can result in difficulties in installation of a sash on a vent arm, because it is difficult to know at what angle exactly the vent arm 5 should be attached to the sash.

As can be seen in Figure 2 of the drawings, if the pivot axes 49,51 on the frame bracket 3 pass through the longitudinal axes of the first link 7 and third link 9, the first link 7 and third link 9 can lie partly outside the periphery of the frame bracket 3 when the stay 1 is closed. To avoid this, the present applicant has suggested that the pivot axes 49,51 of the first link 7 and third link 9 on the frame bracket 3 be offset from the longitudinal axes of the first link 7 and third link 9. This is shown in Figure 7 for the first link 7. As a result, when the stay 1 is in its fully closed position, the first link 7 and third link 9 will lie fully within the periphery of the frame bracket 3. A very narrow and compact stay 1 is thereby produced, which can readily be accommodated within any normal channel of a PVC extruded vent frame. Further, less preparation, such as routing, will be required if the stay is to be applied to a timber or aluminium vent frame.

Turning now to Figure 6 of the drawings, the vent arm 5 may include a pair of stops 57 formed by cutting slits or "cracks" in an edge 58 of the vent arm 5 and deforming the resulting free metal of the vent arm 5. A side view of one of the stops 57 is shown in Figure 6A of the drawings. During use, the stay 1 is opened fully and the stops 57 bear against the first link 7 and third link 9 respectively to prevent further opening of the stay 1. This arrangement ensures that the design geometry of the stay is not exceeded and provides the stay 1 with significant strength, thereby resulting in a safer stay.

Further strength can be provided to the stay 1 by means

of an S or Z shaped shoulder 59 formed around the pivot 53 between the first link 7 and the vent arm 5. In a normal prior art stay, a simple shoulder perpendicular to the longitudinal axis of the vent arm 5 is provided to step the end point 25 of the vent arm from the remainder of the vent arm 5. However, if a rib 61 is included as shown in Figure 6, which extends substantially parallel to the longitudinal axis of the vent arm 5, additional rigidity is provided to the vent arm 5, thereby strengthening the area around the pivot 53. This is particularly important when the stay 1 is to be used for side hung windows, which result in additional stresses being applied to the pivot 53 between the first link 7 and the vent arm 5. A side view of the rib 61 can be seen in Figure 6B of the drawings.

If a heavy sash is applied to a stay 1 according to the present invention, the vent arm 5 may clash slightly with the first link 7 and/or the third link 9 during closing of the stay 1. Accordingly, with reference to Figure 7 of the drawings, the applicant has suggested the inclusion of a plastics support or guide block 63 mounted on the first link and/or the third link 9 adjacent the vent arm 5. The or each guide block 63 will be riveted or otherwise fixed to the link 7,9 and will include a ramp portion 65 which is engaged by the vent arm 5 during closing of the stay 1. As a result of this engagement, the vent arm 5 will be raised slightly by the ramp 65, thereby ensuring that the vent arm 5 does not clash with the remainder of the link 7,9 as the stay 1 closes.

Another form of guide block 63 is shown in Figure 7A of the drawings, wherein an extension 67 of the guide block 63 is designed to fit between the vent arm 5 and the first link 7. Further, an edge of the extension 67 is chamfered to conform to the shape of the shoulder 59 of the vent arm 5. By including the extension 67, movement of the vent arm 5 up the ramp 65 during closing of the stay 1 will occur more smoothly.

Finally, an additional plastics block 69 may be included on the frame bracket 3 to facilitate closing of the stay 1.

This block 69 will be held in position by means of the rivet 11 between the frame bracket 3 and the first link 7, together (optionally) with a second rivet 71 joining the block 69 directly to the frame bracket 3. The plastics 5 block will assist in preventing the first link 7 from clashing with the frame bracket 3 during closing of the stay 1.

As will be appreciated, many of the features described herein can be used independently or in combination with 10 other features in a four bar stay according to the present invention. Further, it will be understood that the present invention has been described purely by way of example, and that modifications of detail can be made within the scope of the invention.



CLAIMS

1. A hinge for a vent, the hinge comprising  
mounting means for attachment to a fixed frame,  
5 a vent arm for attachment to a movable vent,  
a first link pivotally attached at pivot points to the  
mounting means and to the vent arm and  
a third link pivotally attached to the mounting means  
and to the vent arm at pivot points spaced from the pivot  
10 points of the first link,  
wherein when the vent arm is attached to a vent, in use,  
the pivot points on the vent arm define a line which is  
inclined to the plane of the vent.
- 15 2. A hinge as claimed in claim 1, wherein the line of the  
pivot points on the vent arm is inclined to the longitudinal  
axis of the vent arm.
3. A hinge for a vent, the hinge comprising  
20 mounting means for attachment to a fixed frame,  
a vent arm for attachment to a movable vent,  
a first link pivotally attached at pivot points to the  
mounting means and to the vent arm and  
a third link pivotally attached to the mounting means  
25 and to the vent arm at pivot points spaced from the pivot  
points of the first link,  
wherein the vent arm has an end point which engages an  
end cap when the hinge is closed.
- 30 4. A hinge as claimed in claim 3, wherein the end point is  
asymmetric.
5. A hinge as claimed in claim 3 or claim 4, wherein the  
end cap is joined to the mounting means.
- 35 6. A hinge for a vent, the hinge comprising  
mounting means for attachment to a fixed frame,  
a vent arm for attachment to a movable vent,

a first link pivotally attached at pivot points to the mounting means and to the vent arm and

a third link pivotally attached to the mounting means and to the vent arm at pivot points spaced from the pivot  
5 points of the first link,

wherein the vent arm overlays the mounting means when the hinge is closed.

7. A hinge for a vent, the hinge comprising  
10 mounting means for attachment to a fixed frame,  
a vent arm for attachment to a movable vent,  
a first link pivotally attached at pivot points to the mounting means and to the vent arm and  
a third link pivotally attached to the mounting means  
15 and to the vent arm at pivot points spaced from the pivot points of the first link,

wherein the vent arm and the mounting means each have a longitudinal axis, the axis of the vent arm overlaying and being aligned with the axis of the mounting means when the  
20 hinge is closed.

8. A hinge as claimed in claim 7, wherein the longitudinal axis of the vent arm is defined by a line of apertures through which fastenings secure a vent to the vent arm, in  
25 use, the line of apertures being parallel to the plane of the vent when the vent is secured to the vent arm.

9. A hinge as claimed in claim 7 or claim 8, wherein the longitudinal axis of the mounting means is defined by a line  
30 of apertures through which fastenings secure the mounting means to a fixed frame, in use, the line of apertures being parallel to the plane of the fixed frame when the mounting means is secured to the fixed frame.

35 10. A hinge for a vent, the hinge comprising  
mounting means for attachment to a fixed frame,  
a vent arm for attachment to a movable vent,  
a first link pivotally attached at pivot points to the

mounting means and to the vent arm and

a third link pivotally attached to the mounting means and to the vent arm at pivot points spaced from the pivot points of the first link,

5 wherein the vent arm extends past the pivot point with the first link to define an end point spaced from the pivot point for engaging an end cap.

11. A hinge as claimed in any two or more of the preceding  
10 claims.

12. A hinge as claimed in any preceding claim, wherein the mounting means is a mounting plate.

15 13. A hinge as claimed in claim 12, wherein the mounting plate has a C-shaped cross section.

14. A hinge as claimed in claim 13, wherein the C-shaped cross section includes inwardly extending flanges.  
20

15. A hinge as claimed in any one of claims 1 to 11, wherein the mounting means comprises a plane strip which includes raised portions at the pivot points with the first and third links.  
25

16. A hinge as claimed in any preceding claim, wherein the pivot points on the mounting means define a line which is inclined to the longitudinal axis of the mounting means.

30 17. A hinge as claimed in claim 16, wherein the pivot points on the mounting means are off-set on opposite sides of the central longitudinal axis of the mounting means.

18. A hinge as claimed in any preceding claim, wherein the  
35 pivot points of the first link are positioned towards the edges of the vent arm and the mounting means respectively which are furthest from each other when the hinge is open.

19. A hinge as claimed in any preceding claim, wherein the pivot points of the third link are positioned towards the edges of the vent arm and the mounting means respectively which are closest to each other when the hinge is open.

5

20. A hinge as claimed in any preceding claim, wherein the mounting means and the vent arm each include holes or apertures through which fastening devices may be applied to secure the mounting means and the vent arm to a fixed frame and a sash respectively on a vent, in use.

10

21. A hinge as claimed in any preceding claim, wherein an end point is formed integrally with the vent arm.

15 22. A hinge as claimed in any preceding claim, wherein an end cap defines an internal surface inclined to the longitudinal axis of the mounting means.

20 23. A hinge as claimed in claim 22, wherein the angle of inclination of the internal end cap surface is different to that of the complementary surface on the end point of the vent arm.

24. A hinge as claimed in claim 22 or claim 23, wherein the inclined surface includes two bearing surfaces inclined at different angles to the longitudinal axis of the mounting means.

25 25. A hinge as claimed in any preceding claim, wherein an end cap and/or an end point of the hinge are manufactured from plastics material.

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26. A hinge as claimed in any preceding claim, wherein an end point includes an edge inclined to the longitudinal axis of the vent arm.

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27. A hinge as claimed in claim 26, wherein the inclined edge of the end point is curved, preferably in a concave

fashion.

28. A hinge as claimed in any preceding claim, wherein a stop is provided to define the maximum opening of the hinge.

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29. A hinge as claimed in claim 28, wherein the stop acts between the vent arm and the first link.

30. A hinge as claimed in any preceding claim, wherein a stop acts between the vent arm and the third link.

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31. A hinge as claimed in any one of claims 28, 29 or 30, wherein the stop is formed by means of a crack in the vent arm.

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32. A hinge as claimed in claim 28, wherein the stop is integral with an end point of the vent arm.

33. A hinge as claimed in claim 32, wherein the end point acts as a rubbing block during closing of the hinge.

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34. A hinge as claimed in any preceding claim, wherein, when the hinge is fully open, the vent arm is inclined to the mounting means at an angle of less than 90°, preferably about 45° or less.

25

35. A hinge as claimed in any preceding claim, wherein a reinforcing shoulder is formed adjacent a pivot point.

36. A hinge as claimed in claim 35, wherein the reinforcing shoulder is substantially S or Z shaped.

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37. A hinge as claimed in claim 35 or 36, wherein the reinforcing shoulder is formed by forming kinks in the vent arm.

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38. A hinge as claimed in any preceding claim, wherein a guide block is provided on the first link and/or on the

third link to assist the motion of the vent arm during closing of the hinge.

39. A hinge as claimed in claim 38, wherein the or each  
5 guide block is attached to the link by means of a push fit.

40. A hinge as claimed in any preceding claim, wherein a support block is provided on the mounting means to assist the vent arm as it closes over the mounting means.

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41. A hinge as claimed in any preceding claim, wherein at least one pivot point includes a washer to provide friction to the hinge such that the hinge can be held in a partially open position by virtue of the friction.

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42. A hinge substantially as hereinbefore described with reference to and as shown in any one or more of the accompanying drawings.

20 43. A vent system comprising a fixed frame, a hinge as claimed in any preceding claim and a vent or sash mounted on the vent arm of the hinge.

44. A vent system substantially as hereinbefore described  
25 with reference to and as shown in any one or more of the accompanying drawings.



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Claims searched: 1, 12 - 41

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**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): E2F (FSG)

Int Cl (Ed.6): E05C 17/00 E05D 15/28, 15/30, 15/32, 15/40, 15/44, 15/46

Other: Online: WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2236799 A (Buckley) See 15, 19 in figure 2 & page 5 lines 15-22 and page 12 lines 21-26	1, 20 - 41
X	GB 2225378 A (Jack) See especially 18 in figures 1-3 & page 5 lines 28-33	1, 20 - 41
X	GB 2165883 A (Borup-Nielsen) See 20, 22 in figures & page 1 line 123 to page 2 line 4	1, 12 - 41
X	GB 2125867 A (Lahmann) See 22, 29 in figures 5 and 6 and page 2 lines 32-41	1
X	GB 2081803 A (Buckley) See especially 23, 25 in figure 1	1, 20 - 41
X	GB 1299154 A (Kvasnes) See 2, 17 in figure 5	1, 20 - 41
X	WO 91/02874 A (Blomqvist) See 7, 9 in figure 1	1, 20 - 41
X	WO 88/00638 A (Wood) See 15, 16 in figure 3 & page 6 lines 11-16	1, 20 - 41

X Document indicating lack of novelty or inventive step  
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P Document published on or after the declared priority date but before the filing date of this invention.  
E Patent document published on or after, but with priority date earlier than, the filing date of this application.